REMARKS

Applicant has added new Claims 25-45 and has canceled previously withdrawn Claims 21-24. Claims 1-20 are unchanged. Claims 1-20 and 25-45 are pending. Reconsideration and allowance of the claims in light of the present remarks is respectfully requested. Applicant reserves the right to refile Claims 21-24 in a divisional application.

Discussion of the 35 U.S.C. § 102(e) Rejection

Claims 1-4 and 6-20 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Amin et al., U.S. Patent Application Publication No. 2002/0121636 A1.

Applicant recites "wherein each computational element is magnetically coupled to at least one adjacent computational element" in part in Claim 1. In Amin as well as in Applicant's specification, coupling means entanglement of qubits resulting in a coherent quantum system allowing quantum-mechanical interaction between individual qubits (see Applicant's specification, paragraph [0004] on page 1 and Amin paragraph [0008]). However, although Amin also relates to quantum computing, Amin doesn't disclose magnetic coupling between adjacent computational elements. Hence, Claim 1 is novel over Amin.

Figure 6A of Amin shows a series of qubits 600-1 to 600-N being the computational elements, whereby each qubit comprises a superconducting loop being a ring-like structure. The qubits 600-1 to 600-N also include junctions 601-x, as described at paragraph [0046: 2nd sentence] and paragraph [0123: last two sentences], allowing currents I_T to enter or leave the qubit. This is clearly illustrated by Figure 13 and paragraph [0053: last 3 sentences]. As the terminals 5-6, 2-3 of the loop constituting the qubits 600-1 and 600-2 are connected at this junction 601-1, it is this physical junction 601-1 that couples adjacent qubits. The junctions which are part of the loops thus allow the physical transfer of charge between linked qubits in order to entangle, i.e., to couple the quantum-mechanical operation of adjacent qubits as disclosed in paragraph [0163: 3rd sentence]. This junction is a physical system of the type of tunnel junctions, semiconducting junctions, two-dimensional electron gas structures (paragraph [0054:1st sentence]) capable of coupling terminals as disclosed in paragraph [0099: 1st sentence].

The Amin reference describes the use of Josephson junctions in SQUID devices to form a 4-terminal junction in paragraph [0051], and the use of a III-V structure to create a quantum well wherein a cloud of electrons is present in paragraph [0088: 2nd and 3rd sentence]. Both of these structures convey electrons and do have a physical transport of currents. A Josephson junction is a type of electronic circuit capable of switching at very high speeds when operated at temperatures approaching absolute zero. A Josephson junction exploits the phenomenon of superconductivity, the ability of certain materials to conduct electric current with practically zero resistance. A Josephson junction is made up of two superconductors, separated by a nonsuperconducting layer so thin that electrons can cross through, i.e., tunnel, the insulating barrier. The flow of current between the superconductors in the absence of an applied voltage is called a Josephson current, and the movement of electrons across the barrier is known as Josephson tunneling. Two-dimensional semiconductor structures are formed by stacking layers of semiconductor materials with different energy band structures such as elements in the III-V group, e.g., Ga, Algas, In and so forth. These so-called heterostructures form a two-dimensional energy structure in which boundaries electrons can freely move, i.e., form a gas or cloud, in some directions but not in other directions.

As discussed here, none of these electrical couplings for the physical transfer of electrons disclosed in Amin is a magnetic coupling of at least one adjacent computational element, as claimed by Applicant. In fact, the Amin reference appears to teach away from the use of magnetic fields for coupling qubits, and teaches the use of applying and reading currents and voltages as described in paragraph [0012: last sentence].

Moreover, as the coupling between the computational elements in Amin is done via physical transfer of charge (currents), magnetic coupling is undesirable. As stated inter alia in paragraphs [0054] and [0123], Amin wishes to achieve a small total flux in superconducting loop 122 (which is desirable for decreasing the decoherence rate). Even if "small residual flux" exists within each loop because of spontaneous supercurrents (i.e., by self-induction), it is the transport current I_t and/or an external magnetic field that will affect the quantum states of the qubit associated with this loop, as described at paragraphs [0053: last three sentences], [0061: 1st sentence] and [117: last sentence].

Dependent Claims

Claims 2-20 are dependent either directly or indirectly on the above-discussed independent Claim 1. Applicant respectfully submits that pursuant to 35 U.S.C. § 112, ¶4, the dependent claims incorporate by reference all the limitations of the claim to which they refer and include their own patentable features, and are therefore in condition for allowance. Therefore, Applicant respectfully requests the withdrawal of all claim rejections and prompt allowance of the claims.

Allowable Claim

In the Office Action dated February 16, 2005, paragraph 23 states that Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In response, Applicant has rewritten Claim 5 as new independent Claim 25.

New Claims

Applicant has added new Claims 26-45 to further protect the invention. New Claim 26-45 are similar to Claims 1-20 but make use of the term "quantum computational element", such as described at least on pages 1-2 of the specification.

Conclusion

In light of the above, reconsideration and withdrawal of the outstanding rejections are specifically requested. In view of the foregoing remarks, Applicant respectfully submits that the claims of the above-identified application are in condition for allowance. However, if the Examiner finds any impediment to allowing all claims that can be resolved by telephone, the Examiner is respectfully requested to call the undersigned.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: _5/13/05_

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